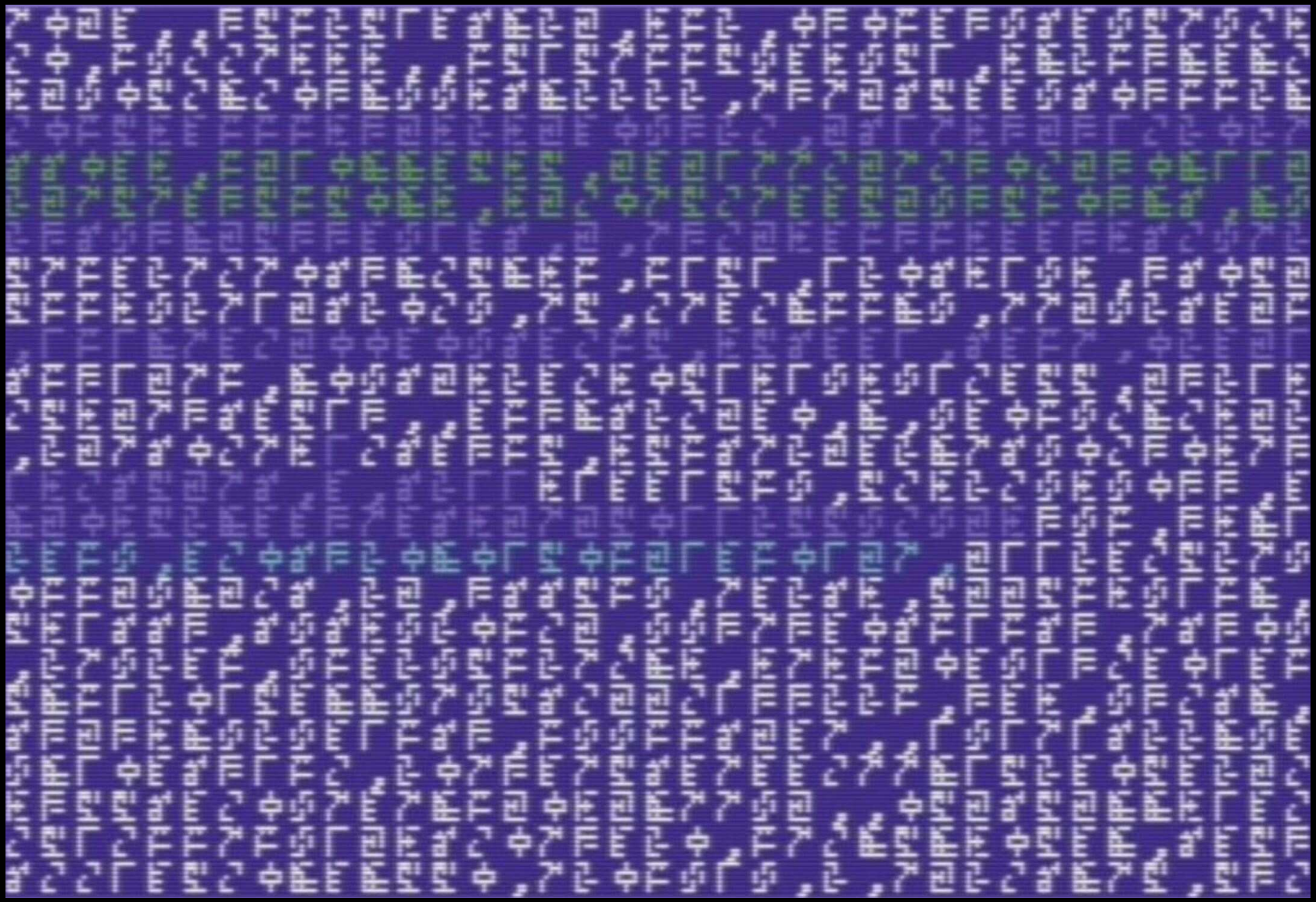
Poems From A Distant Shore: A Reply to Our Cosmic Call



by James Price

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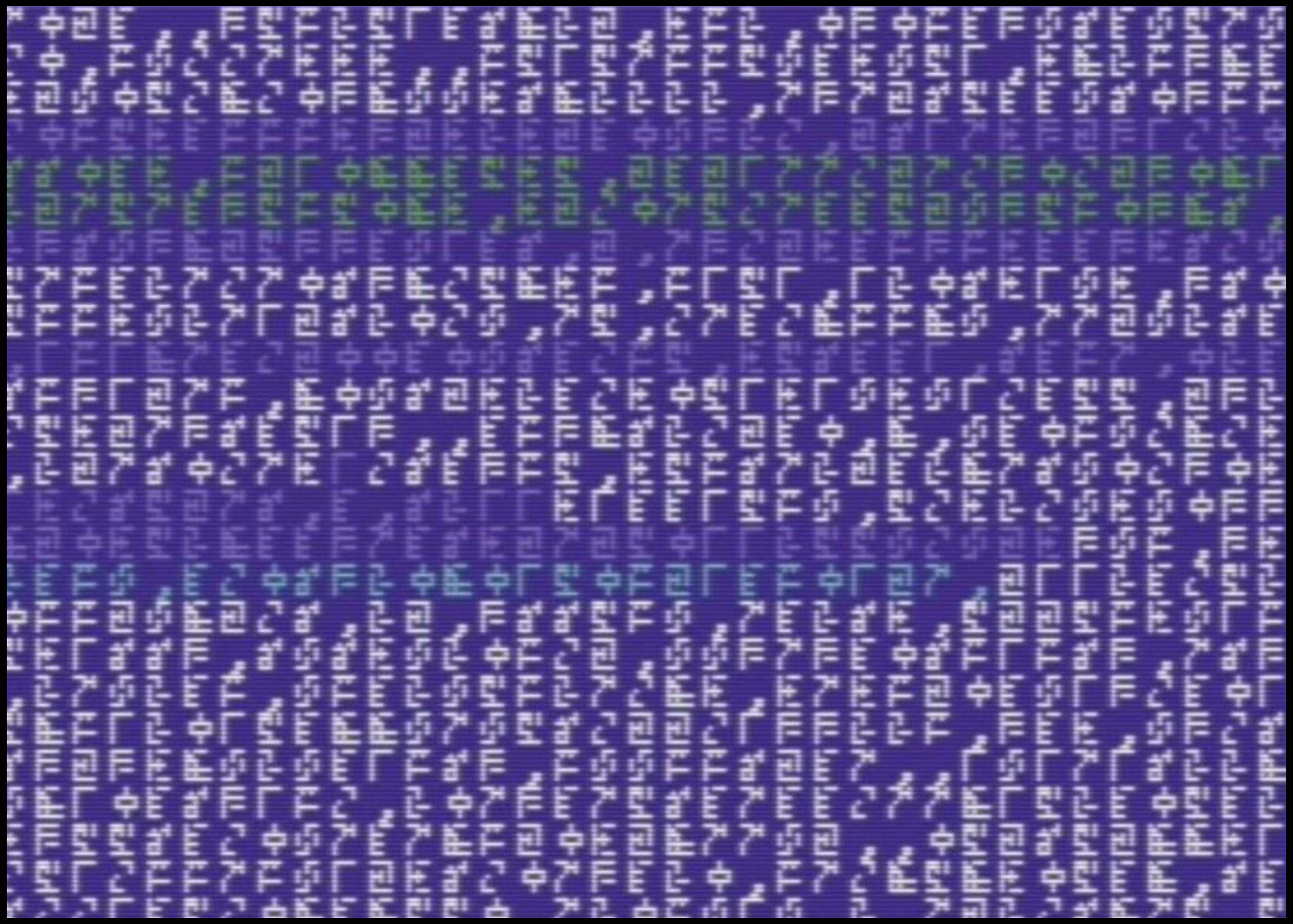

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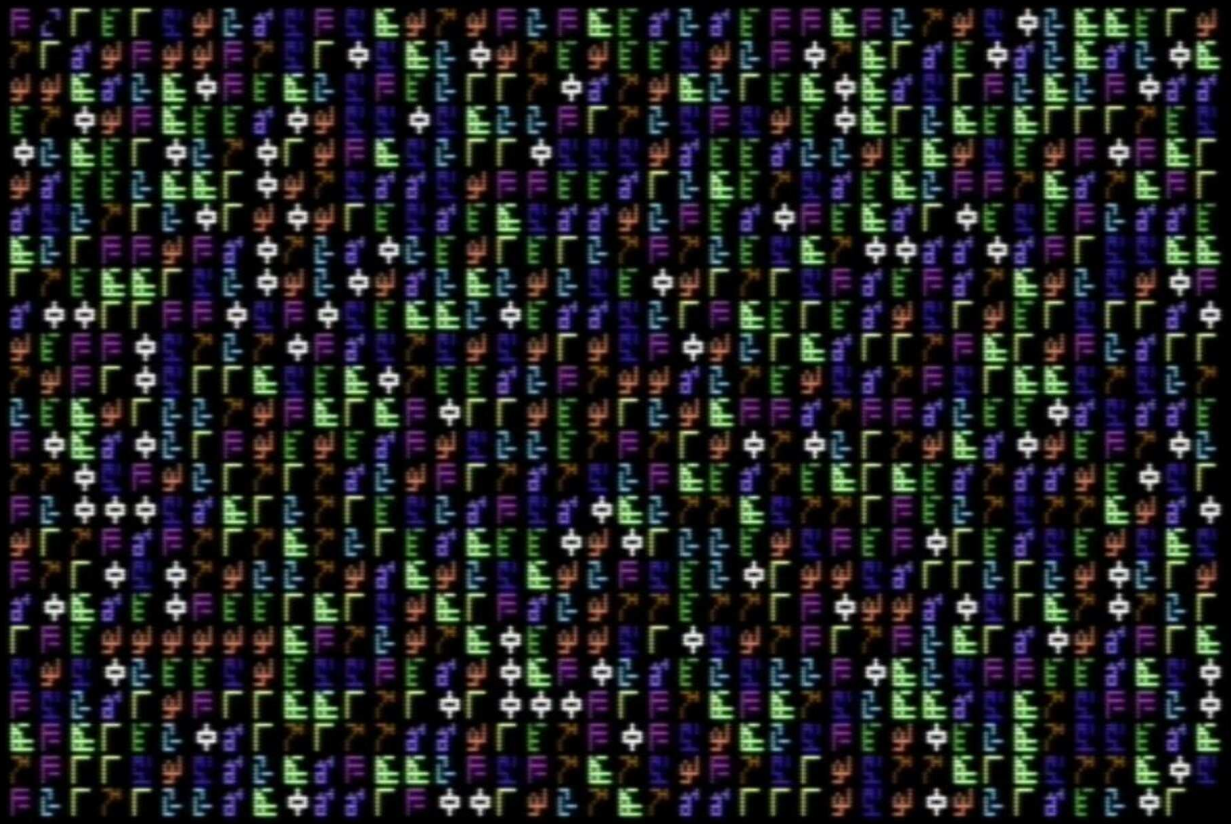
The author thanks DrMortalWombat for writing the oscar64 C compiler for the Commodore 64 that made these explorations possible, backwardspy for the code in haiku.py, and Ecte for providing inspiration to link the Lincos and APL languages.

The author also thanks his wonderful wife Donna for her love and patience.

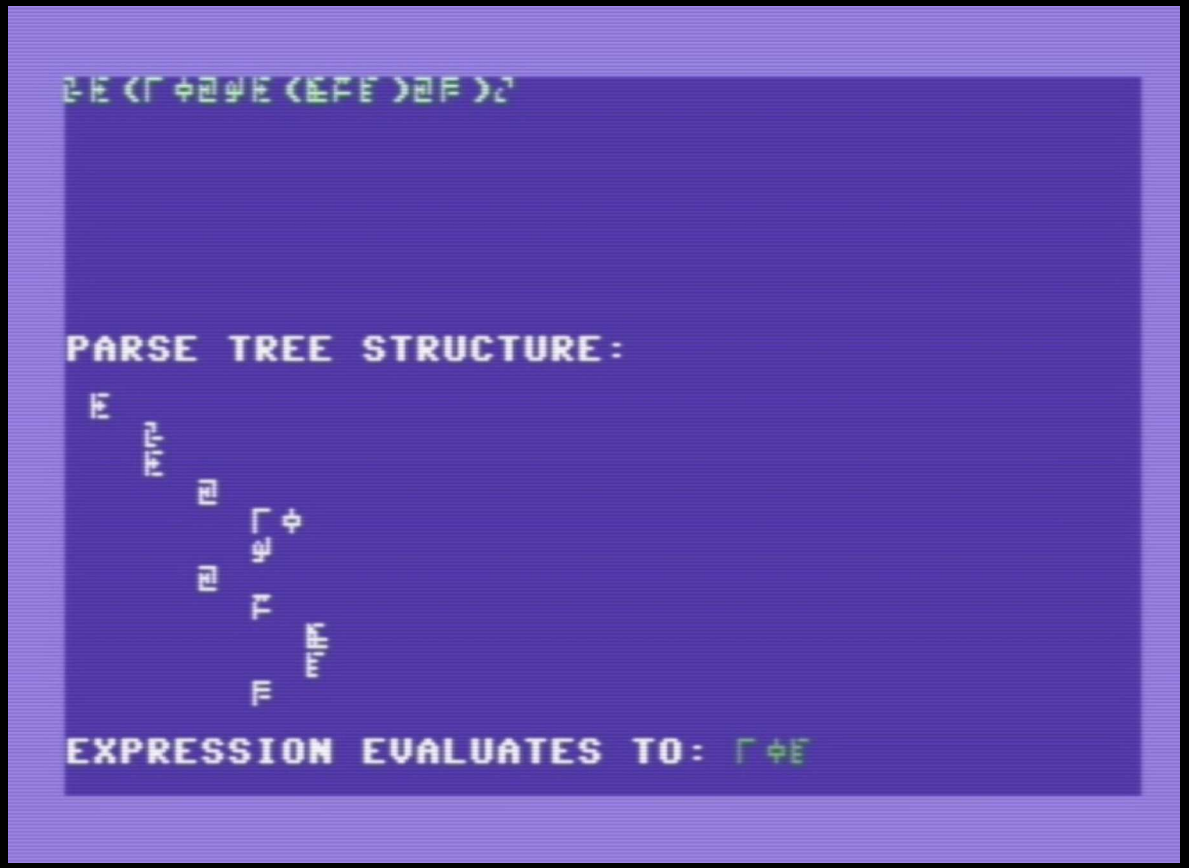
The world's scientific community is abuzz. A radio telescope transmission from another world is being received at Arecibo. Scientists quickly start decoding the message and what at first glance might be the Code of Hammurabi is readily recognised as a list of the first 238 prime numbers, as written in the astrolinguistics language called Lincos.

In 1999, scientists pointed a radio telescope located in Yevpatoria, Ukraine at a small star in the constellation Cassiopeia, and sent a message written in Lincos using a beam that shined brighter than our sun. They called it the Cosmic Call. In addition to a scientific primer in Lincos, an eclectic assortment of community-selected data was also sent. A crowdsourced survey of our world's culture was openly shared with our nearest neighbors.

Now, decades later, we receive a reply.

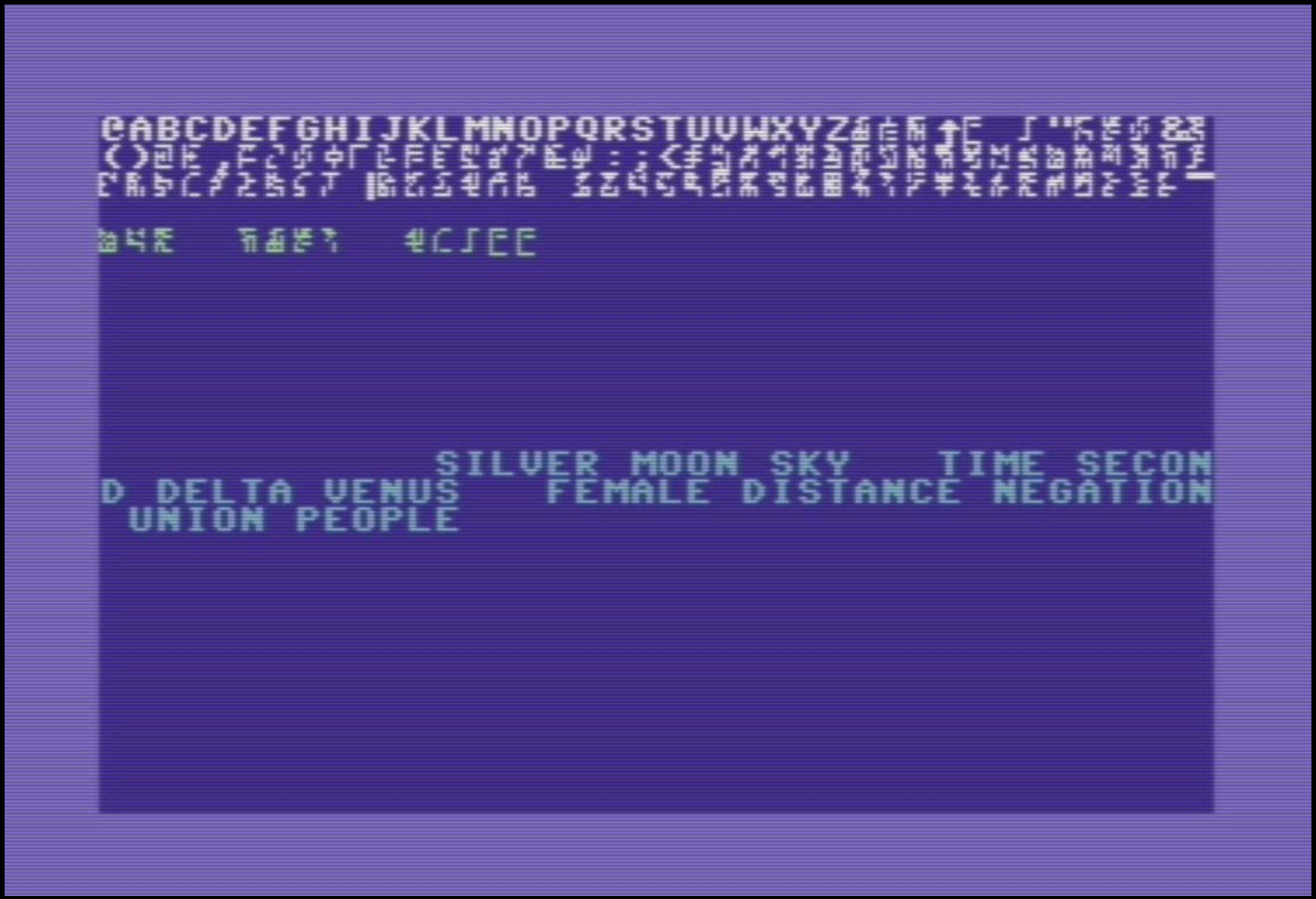


The message continues, the next segment is a Lincos representation of pi to 997 decimal places. Across the stars, we share as a common bond the endlessly deep value of pi, as seen here by aliens who happen to have synesthesia.



The next message segment is an arithmetic expression, followed by what the computer immediately identifies and highlights as a parse tree showing how to evaluate the expression, all in Lincos.

"2+(10*9+(8-4)*3) = 104 They know about recursive descent parsers," DARPA contractor Dr. Dactyl said to his colleague, Senior Analyst Dr. Saltine Charisma, pointing to his screen.



The next message segment is tentatively identified by the scientific community as a fragment of ancient Greek poet Sappho's poetry: **"The moon has set beyond the seas, And vanished are the Pleiades; Half the long weary night has gone, Time passes—yet I lie alone."**

"What's this next segment here, it looks like total nonsense to me," he continued.

"I think theres some meaning here," replied Saltine. "I think its a translation of a Sappho poem, I recognise it from when I studied the classics in high school. They included a lot of random stuff in the Cosmic Call 1999 message's user data payload segment, I'm pretty sure I remember they beamed out a few poems by Sappho in the original Greek, encoded in an 8-bit ASCII code variant."

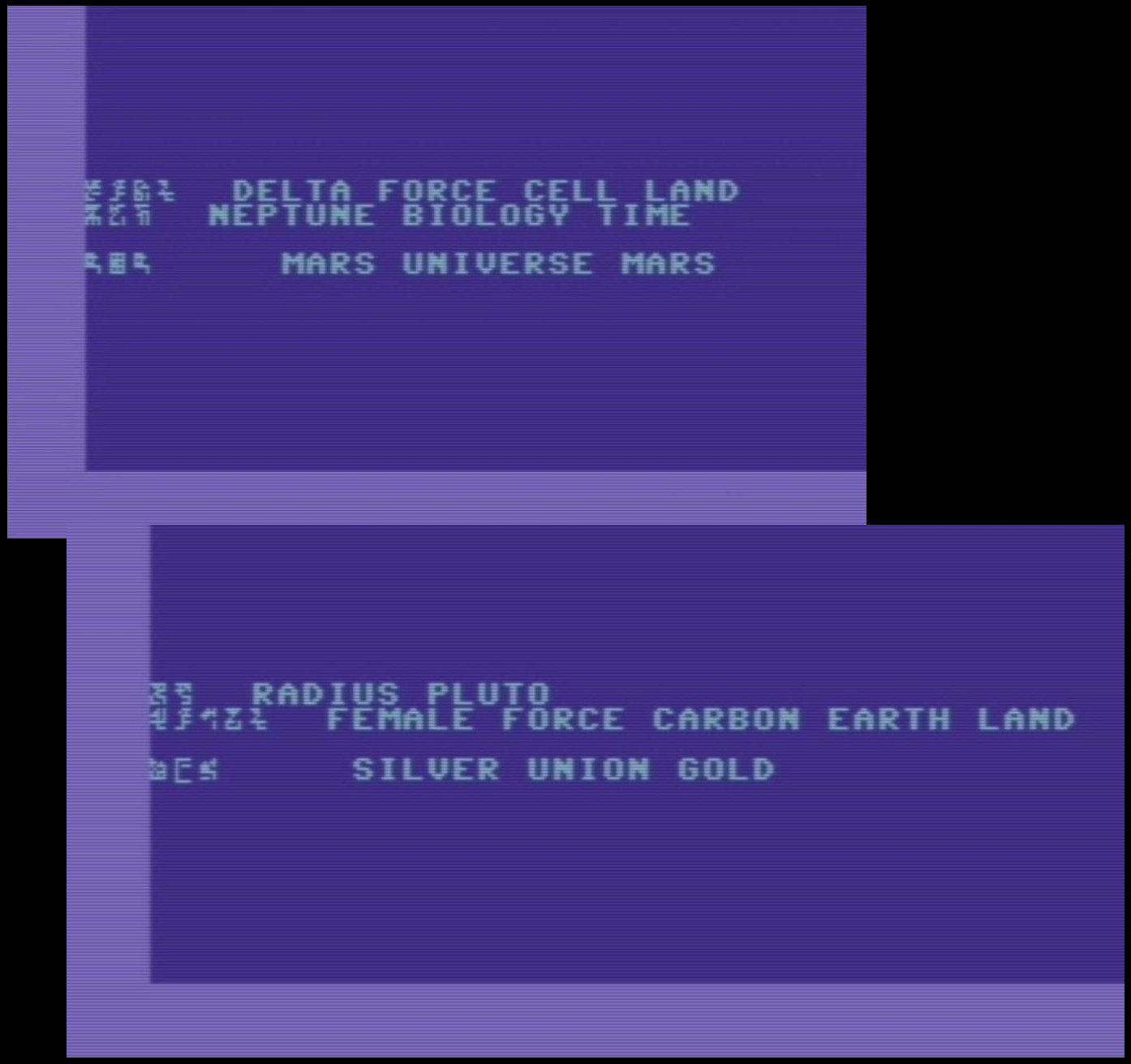
"You're telling me they are sending us back their translation of a fragment of ancient Greek lyric poetry?"

"Looks like it," said Saltine with a smile. "Did you ever write poetry, Terry? What about sonnets, haiku, didn't you try them out in school? You remember how haiku works, 5 syllables, 7 syllables, 5 syllables."

"Yeah, I always enjoyed writing them."

"Good, then you're going to like these next message segments that just came in."

Recognising the format, the scientists quickly identified the next segments as haikus:


DELTA FORCE CELL LAND
NEPTUNE BIOLOGY TIME
MARS UNIVERSE MARS
RADIUS PLUTO
FEMALE FORCE CARBON EARTH LAND
SILVER UNION GOLD

python code to count all the haikus in Lincos:

```
"""
How many distinct haikus are there in a language with 16 one-syllable
words, 22 two-syllable words, 11 three-syllable words, 5 four-syllable
words and 1 five-syllable word,  assuming a haiku is simply
a set of words following the 5/7/5 format.
"""
import math


def constrained_partitions(n, k, min_elem, max_elem):
    """
    Yields every way to break down ``n`` into ``k`` segments,
    where min_elem <= segment <= max_elem

    Credit:
    https://stackoverflow.com/a/59131521/5472162
    """
    allowed = range(max_elem, min_elem - 1, -1)

    def helper(n, k, t):
        if k == 0:
            if n == 0:
                yield t
        elif k == 1:
            if n in allowed:
                yield t + (n,)
        elif min_elem * k <= n <= max_elem * k:
            for v in allowed:
                yield from helper(n - v, k - 1, t + (v,))

    return helper(n, k, ())


def flatten(comp):
    """
    Given an iterator over composition tuples, removes
       zeroes from each of them
    and packs the result into a set to remove duplicated tuples.

    Example of finding the unique compositions of 2:

    >>> comp = constrained_partitions(2, 2, 0, 2)
    >>> list(comp)
    [(2, 0), (1, 1), (0, 2)]
    >>> flatten(comp)
    {(1, 1), (2,)}
    """
    return set(tuple(filter(None, c)) for c in comp)


def distinct_in_line(words, syllables):
    """
    1. Find the unique compositions of a line with a number of syllables ``l``
    2. Map the compositions to the word count for each syllable
    3. Multiply & sum to count the number of possibilities.
    """
    return sum(
        map(
            lambda c: math.prod(map(lambda n: words[n - 1], c)),
            flatten(constrained_partitions(syllables, syllables, 0, len(words))),
        )
    )


def haikus(words, syllables_per_line):
    """
    Calculate the number of unique haikus that exist with the given
    word counts and number of syllables per line.

    >>> haikus((16, 22, 11, 5, 1), (5, 7, 5))
    897093525553149319486
    """
    return math.prod(
        distinct_in_line(words, syllables) for syllables in syllables_per_line
    )


print(haikus((16, 22, 11, 5, 1), (5, 7, 5)))
```

there are 897,093,525,553,149,319,486 possible haikus that can be written in Lincos. if just 1% of them are any good, you could spend countless human lifetimes reading those millions, billions, trillions of haikus.

the universe would end before you finished

"That's a huge number."

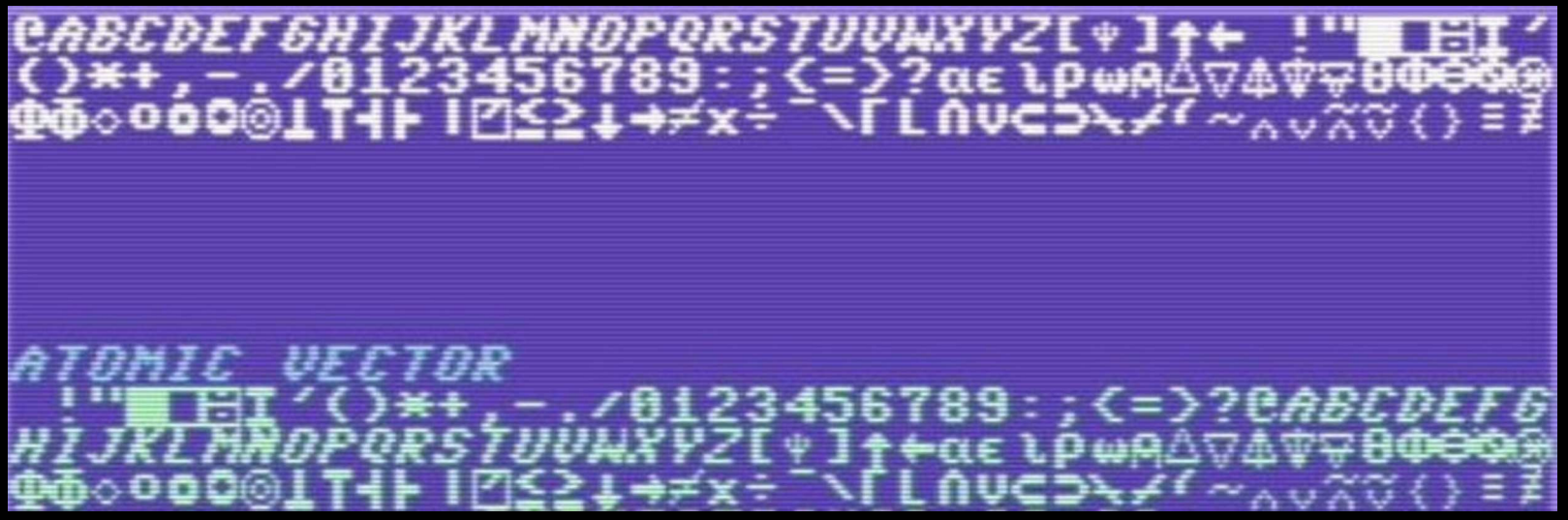
"To us it is, but to some beings it might be a number they can count out on their hands. To them, well, imagine how insignificant we'd be, like gnats. Like nothing at all. Dust."

"So small and inconsequential as an atom."

Dr. Dactyl intently studied the next message segment. It was in a similar but entirely different font. The Lincos numerals were replaced with Arabic numerals, and many strange and curious glyphs appeared. "It's an APL system! I know this!", he ejaculated. "I learned it under Dr. Kenneth Iverson at Harvard!"

"APL, the ancient symbolic math programming language, the one with all the weird UFO symbols and no keywords? But wasn't that like a hundred years ago back in the nineteen hundreds?" asked Saltine.

"Yes, yes it was," Dr. Dactyl sighed wearily, "and I am very old."

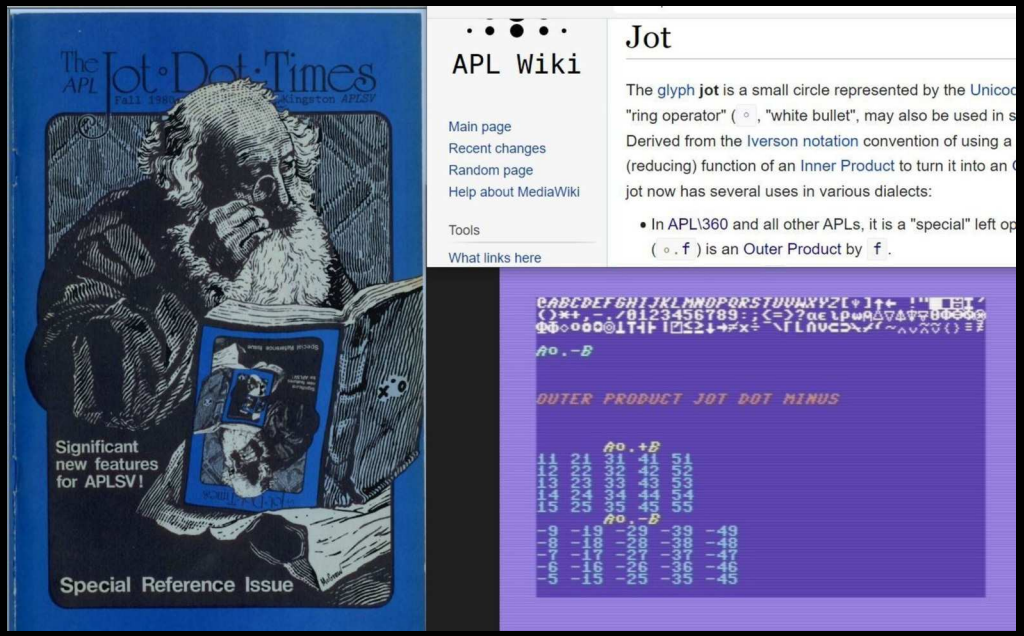


"i think smart older men are hot," chirped Saltine. "especially mathematicians," she cooed. "Why are you cooing, we aren't in some kind of, DARPA fanfic here, Saltine," Dr. Dactyl said with disgust, throwing up his hands for emphasis. "Of course not, I'm just playing with you," said Saltine, as she cast her gaze out the window, across the courtyard, only now noticing a distinguished and intelligent looking middle-aged gentleman on a park bench contently reading a book. "And please capitalize your sentences, this is a professional, secured DARPA work environment." "Sorry," replied Saltine.

Saltine pointed to some faded magazines piled on her desk. "So, I was browsing through these back issues of The Jot Dot Times, the old APL user group newsletter and-" "Just a moment, Saltine, arent those cover images copyrighted?" asked Dr. Dactyl, but Saltine acted like she didnt hear him and continued on. "I'm learning to do outer products." "I'm very proud of you," beamed Dr. Dactyl, "most young people never learn APL, even though it's one of the most important programming languages because it shows how mathematical notation is a tool for thought." "You're right, I'm starting to see numbers and algorithms differently" agreed Saltine. Dr. Dactyl smiled and nodded.

The APL Jot·Dot·Times
Spring 1985
A Product of Kingston APLSV
Special SECURITY Issue
Designing "Bullet-Proof" Code
EVERYTHING you ever wanted to know about APL Security
Outer Product (∘.), or Table is a monadic operator, which will produce a dyadic function when applied with a dyadic function.
Outer product applies the operand function on each element of the left array with each element of the right array. It can be described as a shortcut for constructing nested for loops.
Main page
Recent changes
Random page
Help about MediaWiki
VICE (C64SC)
File Edit Snapshot Settings Help
⍺∘.xB
OUTER PRODUCT JOT DOT TIMES
A
1 2 3 4 5
B
10 20 30 40 50
AxB
10 40 90 160 250
⍺∘.xB
10 20 30 40 50
20 40 60 80 100
30 60 90 120 150
40 80 120 160 200
50 100 150 200 250
71.73% cpu
35.952 fps
CRT controls
Mixer controls
Tape: 000 8:13.0
Joysticks:
ators, which are written as a single glyph, with
outer product operator is a bi-glyph denoted
BQN, where the outer product operator,
has the usual operator syntax.
product

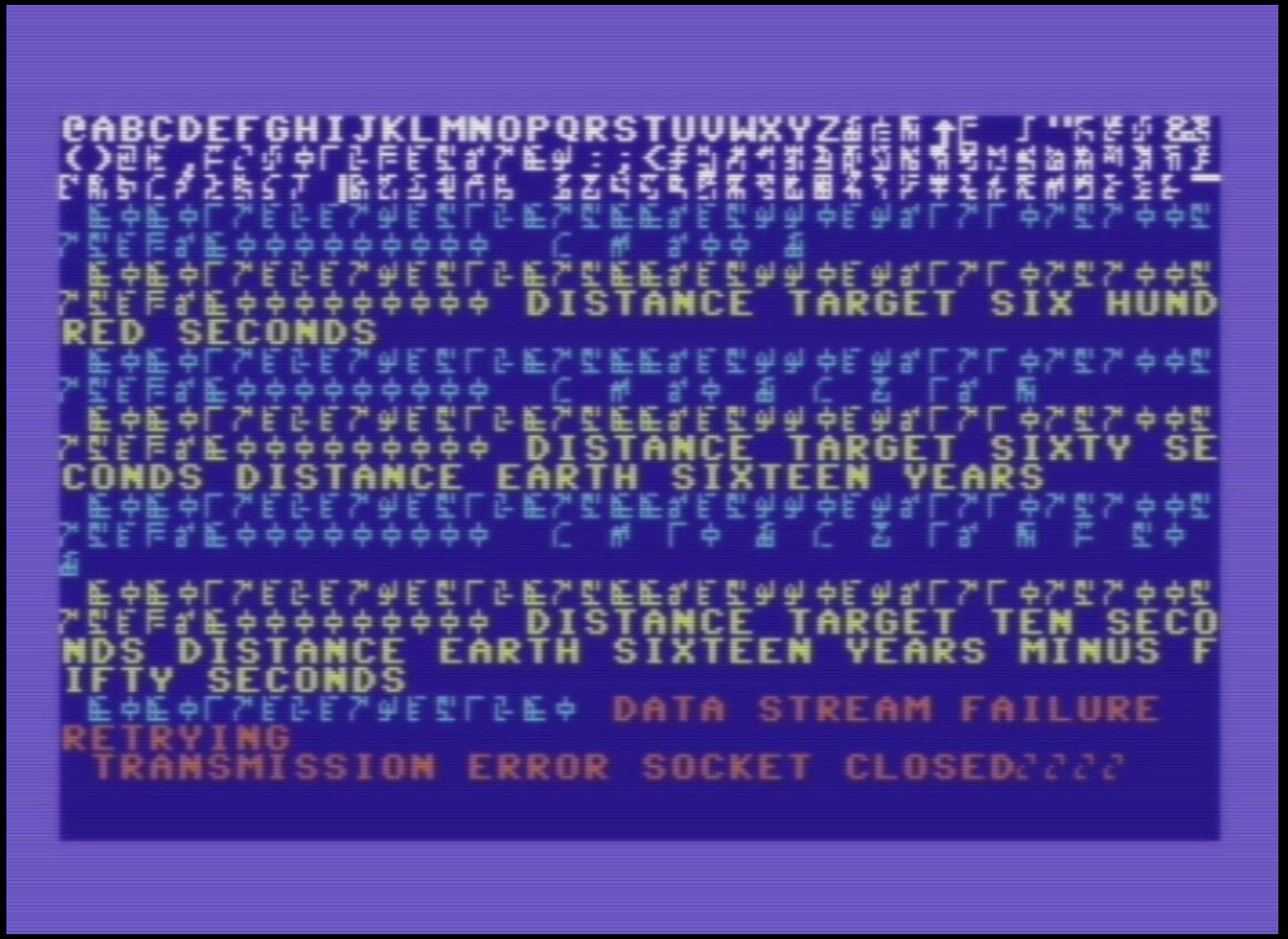
"Why are they demonstrating APL functions to us, do you suppose?" "Well, Saltine, just as they sent us translations of Sappho poetry that we must imagine pleased them immensely, they must have favored APL." "But how did they know about it?" "I wondered about that too, so I googled it and sure enough, there's an archived USENET post from 1999 in the Cosmic Call newsgroup from someone saying they included the entire C source to APL\71 as their personal message payload. 'So it would never be lost.' they said." "But wouldn't they need a C compiler, and a lexer and parser like lex and yacc to get it working?" "That's why they showed us they know about recursive descent parsing." Saltine smiled and nodded.


The APL Jot·Dot·Times
Significant new features for APLSV!
Special Reference Issue
APL Wiki
Main page
Recent changes
Random page
Help about MediaWiki
Tools
What links here
Jot
The glyph jot is a small circle represented by the Unicod
"ring operator" (∘ , "white bullet", may also be used in s
Derived from the Iverson notation convention of using a
(reducing) function of an Inner Product to turn it into an
jot now has several uses in various dialects:
• In APL\360 and all other APLs, it is a "special" left op
(∘.f) is an Outer Product by f .
⍝ OUTER PRODUCT JOT DOT MINUS
⍳⍳.-⍳⍳
⍳⍳.+⍳⍳
⍳⍳.×⍳⍳

Transit of Venus across the Sun on June 5, 2012

As more message segments came in, our cosmic neighbors were found to be splendid beings in love with the arts as well as the sciences. They were beings of exquisite intellect and elegant sophistication. Poems, mathematical theorems and proofs, incredible insights into the deepest and most refined fields of knowledge were shared. As the days passed, Dr. Dactyl and Dr. Charisma began to think of the aliens as friends.

Then one day something terrible and unexpected happened.


DISTANCE TARGET SIX HUNDRED SECONDS
DISTANCE TARGET SIXTY SECONDS DISTANCE EARTH SIXTEEN YEARS
DISTANCE TARGET TEN SECONDS DISTANCE EARTH SIXTEEN YEARS MINUS FIFTY SECONDS
DATA STREAM FAILURE RETRYING
TRANSMISSION ERROR SOCKET CLOSED

Dr. Dactyl stared at the screen, he recoiled, and blanched. "Oh, no. OH NO!" he shouted. Saltine could tell something was really wrong.
"What does it mean? What's that really long Lincos number in front of all those distances?"

"Have you ever heard of the Monster Group, Saltine? It's an immense, symmetrical structure discovered by group theory mathematicians. It fascinated Dr. John Conway, the British mathematician who invented the cellular automata Game of Life, who even went so far as to call it the "Voice of God". He discovered it has an order of 808,017,424,794,512,875,886,459,904,961,710,757,005,754,368,000,000,000. That's what that Lincos number is, the Monster. Imagine that if instead of living in three dimensions and moving through the forth dimension of time, like we do, that you lived and moved in 196,883 dimensions. Conway's paper about the Monster was in the community data payload, it was all the rage at the time with math nerds."

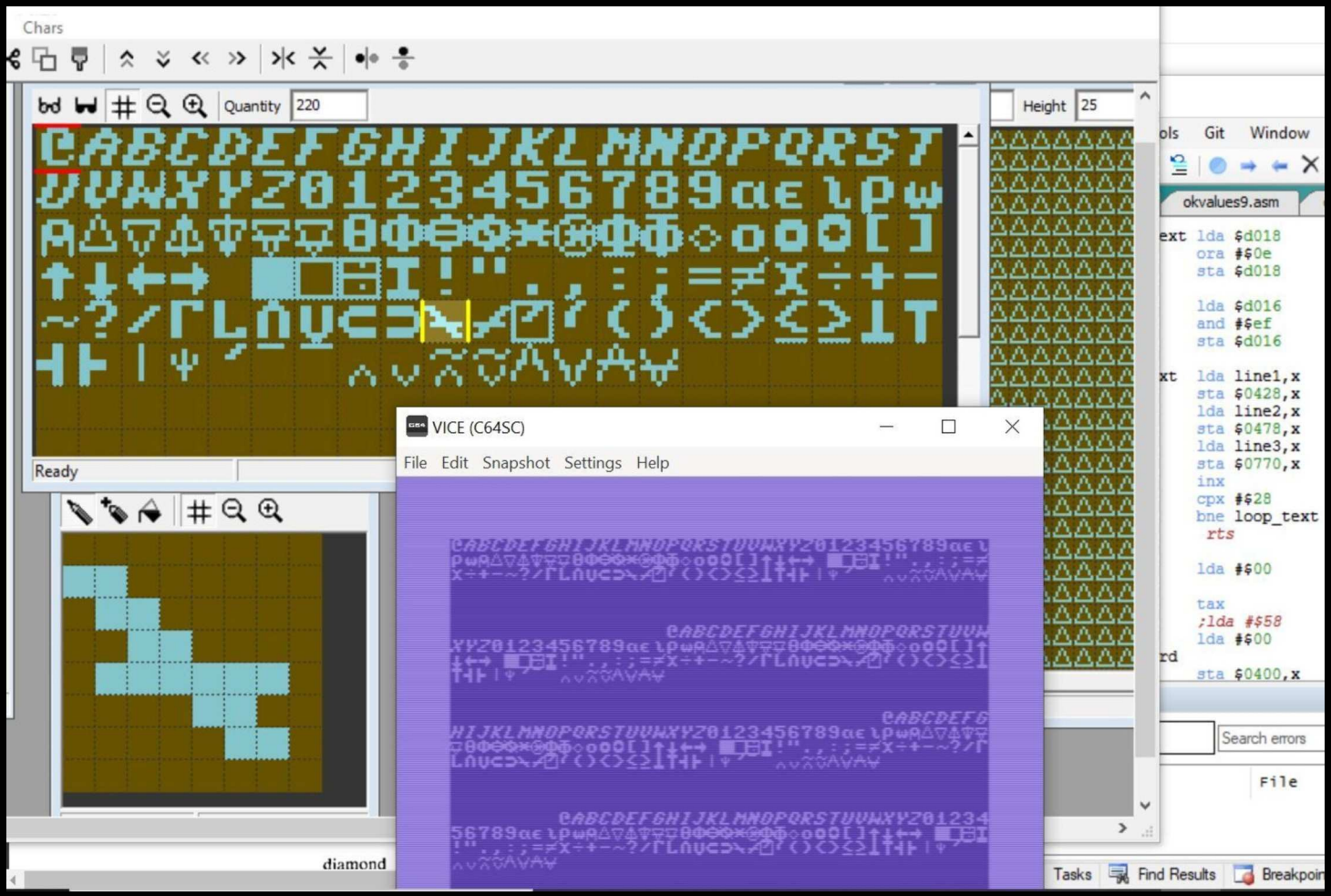
"Hard to even imagine a Monster that vast and complex. It even makes the Lincos haiku space look small. I don't like this, Terry. It's like, the dark forest theory."

"Yes, sad to say, Saltine, whatever got to them is coming for Earth too."

"It says we have sixteen years though, so we- wait, oh no!"

"That's right, sixteen years from when they sent the message, sixteen light years away from here. Sixteen years ago."

A shadow came over the courtyard. Saltine looked outside and saw the man on the park bench look up, cower in terror like an animal, and then flee into the distance. Saltine peered up into the sky and saw a fleet of immense symmetrical structures beginning to pour in. It was like a sudden eclipse, a giant was closing its fist on an ant. Saltine stared up at a huge triangular form filling the sky overhead. She thought it looked a lot like the APL "Grade Up" glyph.


Chars
Quantity
220
Height
25
Ready
diamond
VICE (C64SC)
File Edit Snapshot Settings Help
okvalues9.asm
Git
Window
Search errors
Tasks
Find Results

THE END?

Poetry Transcends Space and Time

When you reach out to a neighboring star, anything might happen. Are you prepared to face the awe and mystery of their reply? And what do you say after you've said Hello?

Critics are raving about Poems From a Distant Shore:
"...a world of its own" - Laura Winter, poet of the Anthropocene

James Price is a freelance journalist who writes about emergent technologies, philosophy of science, and aerospace matters of the utmost importance to our national security.